Claims

1. An electrodeionization device through which is provided a first and second flow path, the electrodeionization device comprising a plurality of depletion compartments and a plurality of concentration compartments interposed between an anode assembly and a cathode assembly, the depletion and concentration compartments arranged in alternating sequence;

said first flow path configured to introduce fluid into and release fluid from each said depletion compartment substantially contemporaneously;

said second flow path configured to introduce fluid into and release fluid from each said concentration compartment substantially contemporaneously;

each depletion compartment having a plurality of ion depletion channels capable of allowing the release of ions from a fluid passing therethrough when a current is generated between said anode and cathode assemblies, each depletion compartment configured such that fluid brought thereinto flows into each said ion depletion channel substantially sequentially; and

each concentration compartment having a plurality of ion concentration channels capable of allowing the migration of ions into a fluid passing therethrough when a current is generated between said anode and cathode assemblies, each depletion compartment configured such that fluid brought thereinto flows into each ion concentration channel substantially sequentially.

2. The electrodeionization device of claim **1**, wherein either said anode assembly or said cathode assembly comprises a plurality of electrode plates.

3. The electrodeionization device of claim **1**, wherein
said anode assembly comprises a plurality of anode plates; and
said cathode assembly comprises a plurality of cathode plates.

4. The electrodeionization device of claim **3**, wherein
the number of anode plates, cathode plates, ion depletion channels in each depletion compartment, and ion concentration channels in each concentration compartment is the same.

5. The electrodeionization device of claim **4**, where said number is three.

6. The electrodeionization device of claim **2**, wherein said anode assembly and said cathode assembly are connected to a single multiple-outlet power supply.

7. The electrodeionization device of claim **3**, wherein said anode assembly and said cathode assembly are connected to a single multiple-outlet power supply.

8. The electrodeionization device of claim **1**, wherein each depletion and concentration compartment comprises a substantially monolithic thermoplastic framework, said thermoplastic framework formed to define

(a) said channels of the respective compartment,

(b) a fluid inlet and a fluid outlet,

(c) a first and second fluid bypass capable of allowing the fluid to pass through said respective compartment without passing through said channels of said respective compartment, and

(d) a series of connecting fluid pathways that (i) connect said fluid inlet to the leading channel in said respective compartment, and (ii) connect the trailing channel in said respective compartment to said fluid outlet.

9. The electrodeionization device of claim **8**, wherein the thermoplastic framework of each said concentration compartment and each said depletion compartment is essentially identical.

10. An electrodeionization device through which is provided a first and second flow path, the electrodeionization device comprising a plurality of depletion compartments and a plurality of concentration compartments interposed between an anode assembly and a cathode assembly; the depletion and concentration compartments arranged in alternating sequence;

said first flow path configured to introduce fluid into and release fluid from each said depletion compartment;

said second flow path configured to introduce fluid into and release fluid from each said concentration compartment;

each depletion compartment having a plurality of ion depletion channels capable of allowing the release of ions from a fluid passing therethrough when a current is generated between said anode and cathode assemblies; and

each concentration compartment having a plurality of ion concentration channels capable of allowing the migration of ions into a fluid passing therethrough when a current is generated between said anode and cathode assemblies;

wherein at least one of said anode assembly or said cathode assembly comprises a plurality of electrode plates.

11. The electrodeionization device of claim **10**, wherein
said anode assembly comprises a plurality of anode plates; and
said cathode assembly comprises a plurality of cathode plates.

12. The electrodeionization device of claim **11**, wherein
the number of anode plates, cathode plates, ion depletion channels in each depletion compartment, and ion concentration channels in each concentration compartment is the same.

13. The electrodeionization device of claim **12**, wherein said number is three.

14. The electrodeionization device of claim **10**, wherein said anode assembly and said cathode assembly are connected to a single multiple-outlet power supply.

15. The electrodeionization device of claim **11**, wherein said anode assembly and said cathode assembly are connected to a single multiple-outlet power supply.

16. An electrodeionization device through which is provided a first and second flow path, the electrodeionization device comprising a plurality of depletion compartments and a plurality of concentration compartments interposed between an anode assembly and a cathode assembly; the depletion and concentration compartments arranged in alternating sequence;

said first flow path configured to introduce fluid into and release fluid from each said depletion compartment;

said second flow path configured to introduce fluid into and release fluid from each said concentration compartment;

each depletion compartment and each concentration compartment containing ion-exchange resin beads, the average size of the resin beads in the concentration compartments being substantially smaller than the average size of resin beds in the depletion compartments.

17. The electrodeionization device of claim **16**, wherein the diameter of the resin beads is between about 0.033 and about 0.012 inch.

18. The electrodeionization device of claim **16**, wherein either said anode assembly or said cathode assembly comprises a plurality of electrode plates.

19. The electrodeionization device of claim **1**, wherein each depletion compartment and each concentration compartment contains ion-exchange resin beads, the average size of the resin beads in the concentration compartments being substantially smaller than the average size of resin beds in the depletion compartments.